UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/180,882	07/12/2011	Chinniah Thiagarajan	10SFS0002-US-NP	3286

23413 7590 04/27/2017

CANTOR COLBURN LLP
20 Church Street
22nd Floor
Hartford, CT 06103

EXAMINER
RUMMEL, JULIA L

ART UNIT	PAPER NUMBER
1784	

NOTIFICATION DATE	DELIVERY MODE
04/27/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

usptopatentmail@cantorcolburn.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte CHINNIAH THIAGARAJAN, UDIT KULMI,
and SANTHOSH KUMAR RAJENDRAN

Appeal 2016-001629
Application 13/180,882
Technology Center 1700

Before TERRY J. OWENS, PETER F. KRATZ,
and N. WHITNEY WILSON, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

The Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1–6, 11–14, and 16. We have jurisdiction under 35 U.S.C. § 6(b).

The Invention

The Appellants claim a multiwall sheet. Claim 1 is illustrative:

1. A multiwall sheet, comprising:
walls, wherein the walls include;
a first wall;
a second wall; and
a transverse wall, wherein the first wall, the second wall, and the transverse wall extend longitudinally; and

a rib extending between adjacent walls, wherein a layer is formed by two adjacent walls;

wherein the layer is filled with a nanoporous foam material; and

wherein the multiwall sheet comprises a normalized thermal conductivity value less than or equal to 1.00 W·m/kg·K.

The References

Manini	US 2003/0127475 A1	July 10, 2003
Rouanet	US 2005/0074566 A1	Apr. 7, 2005
Harris	US 2006/0292404 A1	Dec. 28, 2006
Thiagarajan (Thiagarajan '665)	US 2009/0148665 A1	June 11, 2009
Thiagarajan (Thiagarajan '248)	US 8,889,248 B2	Nov. 18, 2014
Glorieux	EP 2 292 408 A1	Mar. 9, 2011

Aerogel Technologies, *About Aerogels* (© 2004–2014).

FAO Corporate Document Repository, *The use of ice on small fishing vessels: 5. Thermal insulation materials, technical characteristics and selection criteria*, http://www.fao.org/DOCREP/006/Y5013E/y5013e08.htm (July 2, 2007) (hereinafter Thermal Insulation Materials).

SABIC Innovative Plastics, *Lexan* Thermoclear* Plus 2UV Softlite Sheet Product Data Sheet* (May 2008) (hereinafter SABIC).

The Rejections

The claims stand rejected under 35 U.S.C. § 103 as follows: claims 1–6, 11–14, and 16 over SABIC in view of Thiagarajan '665 and over SABIC in view of Thiagarajan '665 and Thermal Insulation Materials, claims 4 and 16 over SABIC in view of Thiagarajan '665 and Manini and over SABIC in view of Thiagarajan '665, Thermal Insulation Materials and Manini, claims 1–3 and 11 over Glorieux in view of Aerogel Technologies

and Thermal Insulation Materials, claims 1–3, 5, 6, and 11–14 over Rouanet in view of Aerogel Technologies and Thermal Insulation Materials, and claims 4 and 16 over Rouanet in view of Aerogel Technologies, Thermal Insulation Materials and Harris. Also, claims 1–3 stand rejected on the ground of nonstatutory obviousness-type double patenting over claim 1 of Thiagarajan '248 in view of Thiagarajan '665, and claim 14 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

OPINION

We affirm the rejections.

Rejections of claims 1–6, 11–14, and 16 over SABIC in view of Thiagarajan '665 and over SABIC in view of Thiagarajan '665 and Thermal Insulation Materials, and rejection of claims 4 and 16 further in view of Manini

The Appellants argue the claims in two groups: 1) claims 1–3, 5, 6, and 11–14, and 2) claims 4 and 16 (Br. 8–14, 17). The Appellants address dependent claims 2, 3, 5, 6, and 14 but do not provide a substantive argument as to their separate patentability (Br. 11). We therefore limit our discussion to one claim in each group, i.e., claims 1 and 16. Claims 2–6 and 11–14 stand or fall with claim 1, and claim 4 stands or falls with claim 16. *See* 37 C.F.R. § 41.37(c)(1)(iv) (2012).

Claim 1

SABIC discloses a multiwall sheet having the Appellants' recited structure but lacking the nanoporous foam filler (p. 6, LT2UV163X28 and LT2UV459X45).

Thiagarajan '665 discloses a nano-cellular polymer foam which has optical transparency and, compared to a solid polymer, has superior structural, thermal and dielectric properties (¶ 4). The foam is made by contacting with a foaming agent a polymer having an average particle size of about 10 nanometers to about 10 millimeters (which is the average particle size range of the Appellants' polymer contacted with a foaming agent (Spec. ¶ 21)) (¶ 6).[1] The foam has a thermal conductivity of about 0.001 W/m·K at ambient temperature to about 0.01 W/m·K at about 350 ºC (¶ 32) (The thermal conductivity of the Appellants' foam is less than or equal to 0.060 W/m·K, most specifically less than or equal to 0.001 W/m·K (Spec. ¶ 41)).[2] The foam can be used to produce a multiwall sheet comprising nano-cellular foam between two or more plastic sheets and can be used in roofing and glazing applications (¶ 66) (which are among the Appellants' uses of their foam (Spec. ¶ 16)).

[1] Both Thiagarajan '665 (¶ 42) and the Appellants (Spec. ¶ 22) disclose that a polymer having an average particle size of about 1 micron can be used to obtain a nano-cellular polymer foam having an average pore size of about 400 nanometers, which is within the nanometer size ranges of Thiagarajan '665 (about 10 nanometers to less than about 1000 nanometers; ¶ 23) and the Appellants (1 nanometer to less than 1000 nanometers; ¶ 21).

[2] The Examiner finds that the normalized thermal conductivity of SABIC's multiwall sheet can be 1.036 W·m/kg·K (Ans. 6) which appears to be suggestive of values within the Appellants' range of less than or equal to 1.00 W·m/kg·K, and that the normalized thermal conductivity of Thiagarajan '665's nano-cellular polymer foam is less than 1.00 W·m/kg·K (Ans. 6–7). Because those findings are reasonable and the Appellants have not challenged them, we accept them as fact. *See In re Kunzmann*, 326 F.2d 424, 425 n.3 (CCPA 1964).

Thermal Insulation Materials discloses that "[b]est insulation materials should have the lowest thermal conductivity, in order to reduce the total coefficient of heat transmission" (p. 2, Box 5.1).[3]

The Appellants assert that "[t]here is no disclosure or suggestion to use the foam or [sic, of] Thiagarajan in the sheet of SABIC, and no explanation or suggestion of how that would be done" (Br. 9).

"A person of ordinary skill is also a person of ordinary creativity, not an automaton." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007). In making an obviousness determination one "can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418.

The motivation would have been to provide SABIC's sheet structures with enhanced structural and thermal properties provided by Thiagarajan '665's nano-cellular foam (¶ 4). In view of Thiagarajan '665's disclosure that the nano-cellular polymer foam is extruded and can be in a multiwall structure between two or more plastic sheets (¶ 66), one of ordinary skill in the art, through no more than ordinary creativity, would have either coextruded the nano-cellular polymer foam with the plastic sheets or extruded the nano-cellular polymer form and placed it between preformed plastic sheets (which are the methods used by the Appellants (Spec. 51)).

[3] The Appellants assert that Thermal Insulating Materials is not prior art (Br. 12–13). That reference is dated July 2, 2007 (page 1, upper right corner) which is before the Appellants' July 12, 2011 filing date.

Claim 16

Claim 16 depends from claim 1 and requires that "the multiwall sheet is extruded and wherein the nanoporous foam material is in the form of nanometer-sized beads."

The Appellants assert that Thiagarajan '665 does not disclose or suggest nanoporous foam material in the form of nanometer-sized beads (Br. 12–14).

Thiagarajan '665's foaming agent can diffuse into polymer particles having an average particle size as small as about 10 nanometers and diffuse out of the polymer particles such that the particle size is as small as about 100 nanometers (¶¶ 40, 41, 42) which is within the Appellants' nanometer-size range of 1 nanometer to less than 1000 nanometers (Spec. ¶ 21).

Rejection of claims 1–3 and 11 over Glorieux in view of Aerogel Technologies and Thermal Insulation Materials

The Appellants argue the claims in two groups: 1) claims 1–3, and 2) claim 11. Accordingly, we limit our discussion to one claim in the first group, i.e., claim 1, and claim 11. Claims 2 and 3 stand or fall with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv) (2012).

Claim 1

Glorieux teaches that "[f]illing flat multi-walled plastic plates with an insulating material, such as an insulating aerogel with pores of nano-dimensions, is generally known" (¶ 2). Glorieux's invention is a multiwall, light-transmitting, insulating, dome skylight element which comprises light-transmitting, thermoformable plastic upper and lower walls having between them an insulating, light-transmitting filler, typically a silica

aerogel having nano-dimension pores, and can be made by extrusion (Abstract, ¶¶ 1, 5, 8). The aerogel can "be arranged between two solid plates or between two multi-walled plates, wherein the thus formed assembly is typically thermoformed in one operation" (¶ 13).

Aerogel Technologies defines "aerogel" as "an open-celled, mesoporous, solid foam composed of a network of interconnected structures that exhibits a porosity (non-solid volume) of no less than 50%" (p. 3).[4]

The Appellants assert that "Glorieux provides no characterization of the thermal conductivity or insulation value of the light transmitting elements and does not appear to be concerned with such a value" (Br. 15).

As indicated by Glorieux's disclosure that the multiwall plate is super-insulating (¶ 1), Glorieux is concerned with its thermal conductivity. Hence, Glorieux would have led one of ordinary skill in the art, through no more than ordinary creativity, to obtain the super-insulating property by minimizing the normalized thermal conductivity to a value such as less than or equal to 1.00 W·m/kg·K as required by the Appellants' claim 1. *See KSR*, 550 U.S. at 418.

Claim 11

The Appellants assert that "[c]oextrusion is not obvious from Glorieux which discloses a loose fill process" (Br. 16) wherein "the aerogel is arranged loosely in the multi-walled plate and sealed at the edges with tape" (¶ 11).

---

[4] The Appellants assert that Aerogel Technologies cannot be considered prior art because it is undated (it merely provides a copyright date of 2004–2014) (p. 4)) (Br. 14–15). Aerogel Technologies, is not relied upon as prior art but, rather, is relied upon for its definition of "aerogel" (Ans. 15) (As disclosed by that reference, silica aerogels were first reported in 1931 (p. 3)).

Glorieux discloses that the multi-walled plate comprising nano-porous aerogel between thermoformable plastic plates can be manufactured by extrusion (¶ 5).[5]

Rejections of claims 1–3, 5, 6, and 11–14 over Rouanet in view of Aerogel Technologies and Thermal Insulation Materials, and claims 4 and 16 over Rouanet in view of Aerogel Technologies, Thermal Insulation Materials and Harris

The Appellants argue the claims in two groups: 1) claims 1–3, 5, 6, and 11–14, and 2) claims 4 and 16 (Br. 6–18). Hence, we limit our discussion to one claim in each group, i.e., claims 1 and 16. Claims 2, 3, 5, 6, and 11–14 stand or fall with claim 1, and claim 4 stands or falls with claim 16. *See* 37 C.F.R. § 41.37(c)(1)(iv) (2012).

Claim 1

Rouanet discloses a glazing panel which comprises a thermoplastic sheet (512) between and substantially parallel to two thermoplastic sheets (502, 504) and is substantially filled with hydrophobic aerogel particles (510) (¶¶ 27, 36; Fig.11).

Harris discloses a fire-retardant, highly transparent panel comprising a transparent matrix (18) having therein fire-retardant nanoparticles (16) with a diameter which is less than the visible spectrum of light and can be about 0.1 to about 400 nanometers (Abstract; ¶ 32; Fig.2).

The Appellants assert that a desire to minimize Rouanet's panel's thermal conductivity does not render obvious the Appellants' required normalized thermal conductivity value of less than or equal to 1.00 W·m/kg·K (Br. 16–17).

[5] In the loose fill embodiment the sealing tape can be removed after the multiwall plate has been thermoformed (¶ 11).

That assertion is unpersuasive due to lacking evidence or even substantive argument.

Claim 16

The Appellants argue that Harris would not have motivated one of ordinary skill in the art to modify Rouanet's panel because Harris is directed toward maintaining transparency and does not mention or suggest any benefit regarding insulation (Br. 18).

The motivation would have been provided by Rouanet's desire for maximizing light transmission (¶ 28) and Harris' disclosure that the fire-resistant nanoparticles maintain a high level of transparency (¶ 32).

Rejection of claim 14 under 35 U.S.C. § 112, first paragraph, written description requirement

To comply with the 35 U.S.C. § 112, first paragraph, written description requirement, an applicant's specification must "convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention." *Carnegie Mellon Univ. v. Hoffmann-La Roche Inc.*, 541 F.3d 1115, 1122 (Fed. Cir. 2008) (quoting *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563–64 (Fed. Cir. 1991)).

The Appellants' claim 14 depends from claim 1 and requires that "the molten polymer is not gas saturated."

The Appellants assert that their Specification shows possession of that claim feature by disclosing that the nanoporous foam material is a gas saturated polymer but not disclosing that the molten polymer is gas saturated (Br. 7).

The Appellants' Specification states that "[t]he coextrusion process combines the flow of molten polymer (e.g., thermoplastic polymer) with a

gas saturated polymer (e.g., nanoporous foam material)" (¶ 51). That disclosure merely indicates that the nanoporous foam material is gas saturated, not that the molten polymer is not gas saturated.

Obviousness-type double patenting rejection

Thiagarajan '248's claim 1 recites the structure of the Appellants' claim 1's multiwall sheet except for the nanoporous foam filler.

The Appellants assert that "nowhere does Thiagarajan ['665] disclose depositing his foam material into multiwall sheets having ribs and there is no motivation or prompting to modify such a multiwall sheet to include the foam" (Br. 6).

The motivation would have been to provide sheets having Thiagarajan '248's structure with enhanced structural and thermal properties provided by Thiagarajan '665's nano-cellular foam (¶ 4).

For the above reasons we are not persuaded of reversible error in the rejections.

DECISION/ORDER

The rejections under 35 U.S.C. § 103 of claims 1–6, 11–14, and 16 over SABIC in view of Thiagarajan '665 and over SABIC in view of Thiagarajan '665 and Thermal Insulation Materials, claims 4 and 16 over SABIC in view of Thiagarajan '665 and Manini and over SABIC in view of Thiagarajan '665, Thermal Insulation Materials and Manini, claims 1–3 and 11 over Glorieux in view of Aerogel Technologies and Thermal Insulation Materials, claims 1–3, 5, 6, and 11–14 over Rouanet in view of Aerogel Technologies and Thermal Insulation Materials, and claims 4 and 16 over Rouanet in view of Aerogel Technologies, Thermal Insulation Materials and Harris, the obviousness-type double patenting rejection of

claims 1–3 over claim 1 of Thiagarajan '248 in view of Thiagarajan '665, and the rejection of claim 14 under 35 U.S.C. § 112, first paragraph, written description requirement are affirmed.

It is ordered that the Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED